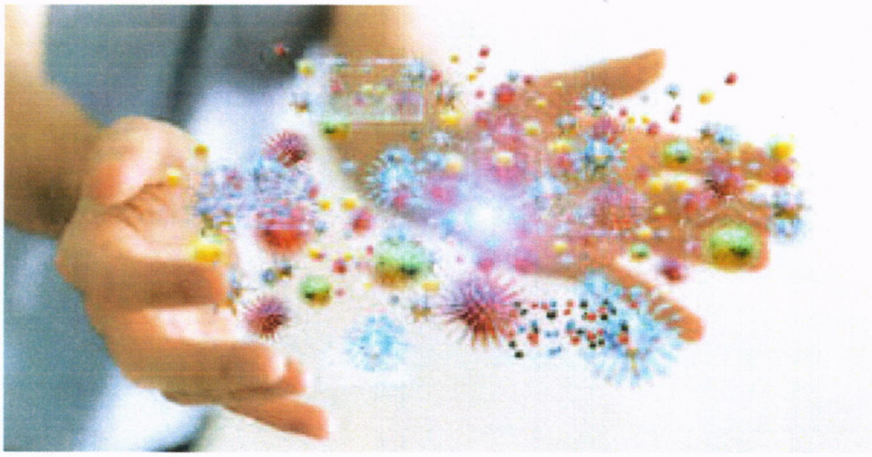
Kingdom of Saudi Arabia
Ministry of Health
Directorate of Health Affairs - Najran
New Najran General Hospital
Infection Prevention &Control Department

المملكة العربية السعودية
وزارة الصحة
مديرية الشؤون الصحية - نجران
مستشفى نجران العام الجديد
قسم مكافحة العدوى

Infection Prevention and Control Department

MDRO PROGRAM



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Title : MDRO Program

Department:	**Infection Prevention and Control**	**Original Date:**	**01.01.2018**
Code Number:	**MDRO Program- 001-01**	**Revised Date:**	**01.01.2023**

1.INTRODUCTION

Multiple drug resistance (MDR), multidrug resistance or multiresistance is antimicrobial resistance shown by a species of microorganism to at least one antimicrobial drug in one or more antimicrobial categories. Antimicrobial categories are classifications of antimicrobial agents based on their mode of action and specific to target organisms. The MDR types most threatening to public health are MDR bacteria that resist multiple antibiotics; other types include
MDR viruses, parasites (resistant to multiple antifungal, antiviral, and ant parasitic drugs of a wide chemical variety).
Recognizing different degrees of MDR in bacteria, the terms extensively drug-resistant (XDR) and pan drug-resistant (PDR) have been introduced. Extensively drug-resistant (XDR) is the non-susceptibility of one bacteria species to all antimicrobial agents except in two or less antimicrobial categories. Within XDR, pan drug-resistant (PDR) is the non-susceptibility of bacteria to all antimicrobial agents in all antimicrobial categories.[1] The definitions were published in 2011 in the journal Clinical Microbiology and Infection and are openly accessible.
Results of antimicrobial susceptibility testing show if bacteria are susceptible (can be treated with the drug), intermediate (may be treatable with the drug, but may require adjusted dosage), or resistant (cannot be treated with drug)
Common multidrug-resistant organisms are usually bacteria:
Vancomycin-Resistant Enterococci (VRE)
Methicillin-resistant Staphylococcus aureus (MRSA)
Extended-spectrum β-lactamase (ESBLs) producing Gram-negative bacteria
Klebsiella pneumoniae carbapenemase (KPC) producing Gram-negatives
Multidrug-resistant Gram negative rods (MDR GNR) MDRGN bacteria such
as Enterobacter species, E.coli, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa
Multi-drug-resistant tuberculosis
Overlapping with MDRGN, a group of Gram-positive and Gram-negative bacteria of particular recent importance have been dubbed as the ESKAPE group (Enterococcus caecum, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas
aeruginosa and Enterobacter species

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VISION
To be an excellent model in infection prevention and control among hospitals in kingdom of Saudi Arabia

MISSION
Infection prevention and control is the responsibility of all to reach healthy and safe environment to reduce health care associated infections (HAIS).

VALUES
Our mission is accomplished through the effort of our administration and IPC staff members by:

1. Excellence	To be the very best in all we do.
2. Integrity	To be honest and meet the highest ethical standard.
3. Respect	To recognize worth, diversity and importance of our colleagues and those with whom we work and serve.
4. Stewardship	To provide quality services.
5. Collaboration	To work with others who share our mission and goals and enhance our work.
6. Professionalism	To uphold the standards of our profession and contribute to its advancement.

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2.PURPOSE

Preventing infections will reduce the burden of MDROs in healthcare settings. Prevention of antimicrobial resistance depends on appropriate clinical practices that should be incorporated into all routine patient care. These include optimal management of vascular and urinary catheters, prevention of lower respiratory tract infection in intubated patients, accurate diagnosis of infectious etiologies, and judicious antimicrobial selection and utilization. Guidance for these preventive practices include the Campaign to Reduce Antimicrobial Resistance in Healthcare Settings ([This link is no longer active: www.cdc.gov/drugresistance/healthcare.]), a multifaceted, evidence-based approach with four parallel strategies: infection prevention; accurate and prompt diagnosis and treatment; prudent use of antimicrobials; and prevention of transmission. Campaign materials are available for acute care hospitals, surgical settings, and pediatric acute care units.

An Antibiogram is a useful tool for the infection preventionists to determine the status of strategies in place to reduce multidrug resistant organisms & monitor trends emerging in the drug resistance.

Antibiogram summarizes the cumulative proportions of pathogenic organisms that are susceptible to particular antimicrobials Prepared by microbiology doctor. This provides a profile of the susceptibilities of specific pathogenic bacteria to antimicrobial agents as tested in routine clinical microbiology practice.

Data should be analyzed when at least 30 isolates are tested for a given pathogen, and only the first isolate should be included from patients with multiple positive cultures

Antibiogram prepared annually by microbiology doctor, send the report to IC, and provide copy to regional AMR coordinator and AMR department in GDIPC.

Data should be used for preparing local antibiotic guideline. Antibiogram regularly discussed by antimicrobial stewardship committee regarding the resistant microorganisms to selected antibiotics. Review the trend of resistance. Misuse of antibiotics.

3.Goals

1.Slow the emergence of resistant bacteria and prevent the spread of resistant infections
2.Strengthen national One Health surveillance efforts to combat resistance
3.Advance development and use of rapid and innovative diagnostic tests for identification and characterization of resistant bacteria
4.Accelerate basic and applied research and development for new antibiotics, other therapeutics, and vaccines objectives
5.Improve international collaboration and capacities for antibiotic resistance prevention, surveillance, control, and antibiotic research and development

4.Antibiograms

The simplest form of MDRO surveillance is monitoring of clinical microbiology isolates resulting from tests ordered as part of routine clinical care. This method is particularly useful to detect emergence of new MDROs not previously detected, either within an individual healthcare facility or community-wide. In addition, this information can be used to prepare facility- or unit-specific summary antimicrobial susceptibility reports that describe pathogen-specific prevalence of resistance among clinical isolates. Such reports may be useful to monitor for changes in known resistance patterns that might signal emergence or transmission of MDROs, and also to provide clinicians with information to guide antimicrobial prescribing practices

MDRO Incidence Based on Clinical Culture Results.

Some investigators have used clinical microbiology results to calculate measures of incidence of MDRO isolates in specific populations or patient care locations (e.g. new MDRO isolates/1,000 patient days, new MDRO isolates per month) Such measures may be useful for monitoring MDRO trends and assessing the impact of prevention programs, although they have limitations. Because they are based solely on positive culture results without accompanying clinical information, they do not distinguish colonization from infection, and may not fully demonstrate the burden of MDRO-associated disease. Furthermore, these measures do not precisely measure acquisition of MDRO colonization in a given population or location. Isolating an MDRO from a clinical culture obtained from a patient several days after admission to a given unit or facility does not establish that the patient acquired colonization in that unit. On the other hand, patients who acquire MDRO colonization may remain undetected by clinical cultures. Despite these limitations, incidence measures based on clinical culture results may be highly correlated with actual MDRO transmission rates derived from information using ASC, as demonstrated in a recent multicenter study. These results suggest that incidence measures based on clinical cultures alone might be useful surrogates for monitoring changes in MDRO transmission rates

MDRO Infection Rates.

Clinical cultures can also be used to identify targeted MDRO infections in certain patient populations or units. This strategy requires investigation of clinical circumstances surrounding a positive culture to distinguish colonization from infection, but it can be particularly helpful in defining the clinical impact of MDROs within a facility

Surveillance for MDROs by detecting asymptomatic colonization

Another form of MDRO surveillance is the use of active surveillance cultures (ASC) to identify patients who are colonized with a targeted MDRO This approach is based upon the observation that, for some MDROs, detection of colonization may be delayed or missed completely if culture results obtained in the course of routine clinical care are the primary means of identifying colonized patients Several authors report having used ASC when new pathogens emerge in order to define the epidemiology of the particular agent In addition, the authors of several reports have concluded that ASC, in combination with use of Contact Precautions for colonized patients, contributed directly to the decline or eradication of the target MDRO However, not all studies have reached the same conclusion. Poor control of MRSA despite use of ASC has been described. A recent study failed to identify cross-transmission of MRSA or MSSA in a MICU during a 10-week period when ASC were obtained, despite the fact that culture results were not reported to the staff.

5.Prevention of Transmission of Multidrug Resistant Organisms

General Recommendations

- Administrative measures
- Education and training
- Judicious use of antimicrobial agents
- Surveillance
- Infection control precautions
- Environmental measures

The CDC system for categorizing recommendations is as follows:
Category IA Strongly recommended for implementation and strongly supported by well-designed experimental, clinical, or epidemiologic studies.
Category IB Strongly recommended for implementation and supported by some experimental, clinical, or epidemiologic studies and a strong theoretical rationale.
Category IC Required for implementation, as mandated by federal and/or state regulation or standard.
Category II Suggested for implementation and supported by suggestive clinical or epidemiologic studies or a theoretical rationale.
No recommendation Unresolved issue. Practices for which insufficient evidence or no consensus regarding efficacy exists

1. Structures and system administrative support

- Make MDRO prevention and control an organizational patient safety priority.
- Provide administrative support, and both fiscal and human resources, to prevent and control MDRO transmission within the healthcare organization.
- Keep good communication and feedback to update on the progress and effectiveness of interventions
- Implement systems to communicate information about reportable MDROs
- Implement multidisciplinary measures to monitor and promote healthcare staff compliance
- Implement systems to designate and communicate information about patients known to be colonized or infected with a targeted MDRO
- Support participation of the facility or healthcare system in local, regional, and national coalitions to combat emerging or growing MDRO problems.
- Human resources: trained infection control practitioners and adequate staffing level
- IT measures to automate antimicrobial requests and control restriction
- Provide hand hygiene and environmental cleaning products
- Provide clinicians with antimicrobial susceptibility reports and analysis of current trends, updated at least annually, to guide antimicrobial prescribing practices.
- Written plan for implementation

2. Education and training of healthcare workers

- Provide training and education on risks and prevention of MDRO spreading during orientation and periodic educational updates for healthcare personnel.
- Do the assessment and evaluation of the staff's knowledge and skills by field observation and the online Infection Control module when available
- Provide clinicians with updated antimicrobial susceptibility reports and analysis of current trends, to guide antimicrobial prescription practices

- Increase the frequency of MDRO educational programs for those who work in areas with high MDRO rates.
- Additional review of wise utilization of antimicrobial agents

3. Judicious use of antimicrobials

- Appropriate use of antimicrobials
- Limit antimicrobial prescription
- Use local antibiogram to effectively treat infections
- Treat infection, not contamination
- Treat infection, not colonization
- Stop treatment when infection is cured or unlikely
- Avoid excessive duration of treatment
- Use narrow spectrum agents and restrict broad spectrum and potent antibiotics
- Implement systems (e.g., computerized physician order entry, comment in microbiology susceptibility report, notification from a clinical pharmacist or unit director) to prompt clinicians to use the appropriate antimicrobial agent and regimen for the given clinical situation.
- Provide clinicians with antimicrobial susceptibility reports and analysis of current trends, updated at least annually, to guide antimicrobial prescribing practices.
- Monitor trends in the incidence of target MDROs in the facility over time using appropriate statistical methods to determine whether MDRO rates are decreasing and whether additional interventions are needed
- Establish a baseline (e.g., incidence) for targeted MDRO isolates by reviewing results of clinical cultures

4. MDRO Surveillance

- A critical component of any MDRO control program
- Important patient safety component
- Allows detection of newly emerging resistance pattern
- Monitors epidemiologic trends in incidence of MDROs over time
- Measures the effectiveness of interventions
- Establish systems to ensure that clinical microbiology laboratories (in-house and out-sourced) promptly notify infection control staff or a medical director/ designee when a novel resistance pattern for that facility is detected
- Use standardized laboratory methods and follow published guidance for determining antimicrobial susceptibility of targeted (e.g., MRSA, VRE, MDR-ESBL) and emerging (e.g., VRSA, MDR-Acinetobacter baumannii) MDROs
- MDRO screening
- Screening is the collection of specimens from specific body sites known to be associated with colonization by a specific microorganism

Indication of screening:

- Screening is appropriate in the following conditions:
- During an outbreak as a part of outbreak investigation and case finding
- As part of infection control measures to manage the outbreak
- As part of routine infection control measures, to find new cases before admission to ICU
- Screening specimens should be taken once the antibiotic has been discontinued for at least 48

hours to avoid false negative results

- Screening may not be appropriate in the following conditions:

Routine screening of well people admitted from the community is not recommended

- Routine screening of staff is not recommended. If staff are epidemiologically linked to the transmission of a MDRO, review infection control practices and predisposing factors
- If it is found incidentally that staff are colonized with MDROs, no work restrictions for these staff are required. Instead, staff should receive education on standard precautions, particularly hand hygiene

Assessment of MRSA decolonization

- Assessment for decolonization will be performed by the Infection Control Practitioner (ICP).
- Consult with ICP on a case-by-case basis regarding the appropriate use of decolonization therapy.
- When decolonization for MRSA is practiced, perform sensitivity testing for the decolonizing agent.
- Monitor susceptibility to detect emergence resistance to the decolonizing agent.
- Test for mupirocin resistance.
- Limit decolonization of HCW discovered to be colonized with MRSA to people who have been epidemiologically linked as a likely original source of ongoing transmission.
- Consider reassignment of HCW if decolonization is not successful and ongoing transmission to patients persists.
- No recommendation for decolonizing cases with MDR gram-negative pathogens such as VRE, CRE

Requirements:

- Maintain Contact Isolation during decolonization treatment.
- Supplies:
- Chlorhexidine 4%.
- Mupirocin/Bactroban, per MD order.
- Clean linens for the bed and patient.
- Personal protective equipment (PPE).

Process

- Spread full-strength Chlorhexidine 4% solution from neck to toes, ensuring coverage of underarms, groin, and between fingers and toes.
- Cover the patient with a sheet and wait for 10 minutes.
- Rinse with warm water.
- Change the bed linens and the patient's clothing completely after each bath/shower.
- Repeat this process twice a day.
- Shampoo hair with the Chlorhexidine solution for 3 days.
- Apply Mupirocin/Bactroban ointment to anterior nares (inside nose) after Chlorhexidine treatment when the patient is dry and dressed as ordered by the MD.
- Mupirocin should not be applied to open wounds.
- These treatments must be given for 7 consecutive days.
- Take a complete set of cultures from nares and previously positive sites 72 hours after decolonization.

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- If the first set of samples is negative, repeat cultures 48 hours later.
- Three negative cultures are required before the patient is cleared of MRSA and can be taken out of isolation.

The ICP will assess these results.

NOTES:

- The patient must not be on antibiotics at the time of screening.
- If any swab is positive, stop the screening process until further assessment.
- Please complete all documentation on this form. The ICP will collect the form when completed.

Hospital Name:	Najran- New Najran General Hospital

January - December 2022

Antimicrobial susceptibility of Gram-Negative bacteria

ISOLATES NAME	COUNT	AMK	AMX	AMC	AMP	AZM	ATM	CZ	CPE	CFM	CTX	FOX	CAZ	CRO	CXM	CEX	CF	CIP	CLR	CLI	CST	DAP	DX	ERY	GEN	IPM	LVX	LZD	MEM	MXF	NIT	NOR	OXA	PEN	TZP	RIF	TET	TGC	TOB	SXT	VAN
Burkholderia																																									
Citrobacter freundii																																									
Citrobacter koseri																																									
E.coli	88	92%		68%			60%		72%				58%	60%	55%										74%	88%			86%		85%	82%			80%					52%	
Enterobacter aerogenes																																									
Enterobacter cloacae																																									
Haemophilus influenzae																																									
Klebsiella oxytoca																																									
Klebsiella pneumoniae	74	85%		28%	10%		62%		36%		22%		52%	32%	30%		20%	56%							52%	68%			70%			35%			58%					42%	
Morganella morganii																																									
Proteus mirabilis	24	68%		62%			75%		70%				65%	68%	66%		70%	60%								66%			68%						90%					35%	
Proteus vulgaris																																									
Providencia stuartii																																									
Salmonella spp																																									
Serratia marcescens																																									
shigella																																									

Antimicrobial susceptibility of Gram negative non- fermenting bacteria

NO ISOLATES NAME	COUNT	AMK	AMX	AMC	AMP	AZM	ATM	CZ	CPE	CFM	CTX	FOX	CAZ	CRO	CXM	CEX	CF	CIP	CLR	CLI	CST	DAP	DX	ERY	GEN	IPM	LVX	LZD	MEM	MXF	NIT	NOR	OXA	PEN	TZP	RIF	TET	TGC	TOB	SXT
Acinetobacter baumannii	26	50%					30%			20%			25%					24%					72%		22%	68%	32%		66%										50%	
Acinetobacter baumannii Complex																																								
Aeromonas sp																																								
Brucella sp																																								
Pseuomonas aeruginosa	30	85%					75%						72%					78%			76%		84%		72%	80%			78%						40%					28%
Stenotrophomonas maltophilia																																								

Antibiotic Abbreviations

Amikacin	AMK	**Azithromycin**	AZM	**Cefixime**	CFM	**Ceftriaxone**	CRO	**Ciprofloxacin**	CIP	**Daptomycin**	DAP	**Imipenem**	IPM	**Moxifloxacin**	MXF
Amoxicillin	AMX	**Aztreonam**	ATM	**Cefotaxime**	CTX	**Cefuroxime**	CXM	**Clarithromycin**	CLR	**Doxycycline**	DX	**Levofloxacin**	LVX	**Nitrofurantoin**	NIT*
Amoxicillin/Clavulanate	AMC	**Cefazolin**	CZ	**Cefoxitin**	FOX	**Cephalexin**	CEX	**Clindamycin**	CLI	**Erythromycin**	ERY	**Linezolid**	LZD	**Norfloxacin**	NOR
Ampicillin	AMP	**Cefepime**	CPE	**Ceftazidime**	CAZ	**Cephalothin**	CF	**Colistin**	CST	**Gentamicin**	GEN	**Meropenem**	MEM	**Oxacillin**	OXA

Penicillin	PEN	**Tigecycline**	TGC
Piperacillin/ Tazobactam	TZP	**Tobramycin**	TOB
Rifampin	RIF	**Trimethoprim/ Sulfamethoxazole**	SXT
Tetracycline	TET	**Vancomycin**	VAN

*Tasted in urinary tract isolates only

<= 69 %	Caution in selecting this antibiotic is advised, discussion with Microbiologist or ID is recommended.	70 % - 79 %	Recommended for empiric therapy if no other choice	>=80 %	Reasonably good susceptibility, recommended as first line empiric therapy for the suspected organism

General Notes:

Statistical validity of estimates of percent susceptibility for organisms for which there are fewer than 30 isolates reported is limited. Please take this into consideration when interpreting the reported results.
Some organisms for which there were only very small numbers OR less than 20 isolates have been excluded from this report
M. catarrhalis: Susceptibility testing is not routinely performed. Most isolates are resistant to ampicillin and amoxicillin but are generally susceptible to other

Hospital Name:	Najran- New Najran General Hospital

January - December 2022

Antimicrobial susceptibility of Gram-Positive bacteria

ISOLATES NAME	COUNT	AMX	AMC	AMP	AZM	ATM	CZ	CPE	CFM	CTX	FOX	CAZ	CRO	CXM	CEX	CF	CIP	CLR	CLI	DAP	DX	ERY	GEN	IPM	LVX	LZD	MEM	MXF	NIT	NOR	OXA	PEN	TZP	RIF	TET	TGC	TOB	SXT	VAN
Clostridioides difficile																																							
Enterococcus faecalis																																							
Enterococcus faecium																																							
Staphylococcus aureus	167	75%							60%								80%		82%			74%	86%			98%			85%		60%			68%	82%	98%			100%
Staphylococcus epidermidis	27								48%						70%		58%		62%			68%	70%			99%			96%		78%							78%	100%
Staphylococcus haemolyticus																																							
Staphylococcus hominis																																							
Streptococcus pneumoniae																																							

Antibiotic Abbreviations

Amikacin	AMK	**Azithromycin**	AZM	**Cefixime**	CFM	**Ceftriaxone**	CRO	**Ciprofloxacin**	CIP	**Daptomycin**	DAP	**Imipenem**	IPM	**Moxifloxacin**	MXF	**Penicillin**	PEN	**Tigecycline**	TGC
Amoxicillin	AMX	**Aztreonam**	ATM	**Cefotaxime**	CTX	**Cefuroxime**	CXM	**Clarithromycin**	CLR	**Doxycycline**	DX	**Levofloxacin**	LVX	**Nitrofurantoin**	NIT*	**Piperacillin/ Tazobactam**	TZP	**Tobramycin**	TOB
Amoxicillin/Clavulanate	AMC	**Cefazolin**	CZ	**Cefoxitin**	FOX	**Cephalexin**	CEX	**Clindamycin**	CLI	**Erythromycin**	ERY	**Linezolid**	LZD	**Norfloxacin**	NOR	**Rifampin**	RIF	**Trimethoprim/ Sulfamethoxazole**	SXT
Ampicillin	AMP	**Cefepime**	CPE	**Ceftazidime**	CAZ	**Cephalothin**	CF	**Colistin**	CST	**Gentamicin**	GEN	**Meropenem**	MEM	**Oxacillin**	OXA	**Tetracycline**	TET	**Vancomycin**	VAN

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M. catarrhalis: Susceptibility testing is not routinely performed. Most isolates are resistant to ampicillin and amoxicillin but are generally susceptible to other